

There's Good News and There's Bad News

**The impact of new technologies on music since the arrival of household electricity
and the phonograph including potential adventures to look forward to**

**IEEE 2004 Conference – History of Electronics
Music and Electronics Session – 28 June 2004**

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Introduction

The following text has been written in a somewhat unorthodox style. This is the case for two reasons. a) It is based on a fast-moving live presentation. With this in mind, it can be seen to be an *aide mémoire* to those who attended the presentation. It has nevertheless been written in such a way that anyone can follow its meaning. b) Unlike most presentations at this conference, it has been specifically designed as a ‘food for thought’ presentation, less based on fact than those of my colleagues in this session. With this in mind, a somewhat alternative layout is a natural consequence. This being the case, for those who would like to know more about what is implied but not fully stated below, please feel free to write to the email address indicated in the header of this text.

The talk is based on an important premise: for all it's worth, the vast majority of today's music around most of the globe is ‘plugged in’ in one way or another.

The good news/bad news story in parts 1 and 2 is a celebration of extraordinary progress as well as an *in memoriam* concerning the destruction of centuries' old traditions, and has intentionally been written somewhat rhetorically. Part 3 looks into the future and, as further food for thought, is to be consumed with a pinch of salt.

I. Late 19th c. – ca. 1945
Engineering and Electrical Innovations & a Few Musical Ones, Too

Appreciation

☺ *Folk/pop/art music*

Enhanced by innovations the world of music is about to be revolutionised. Before the birth of the phonograph and of broadcasting, music was always heard where it occurred. Through these advances, people who were unable to be introduced to various aspects of repertoires would be provided with opportunities to do so that were previously impossible, be it at a much slower pace than in the post World War II era. In short, music appreciation will explode both vertically (choice of repertoire in one's area[s] of interest) and horizontally (diversity of repertoire) as time goes on.

☹ *Folk/pop/art music*

During the revolution in terms of recording and broadcast media that takes place at this time due to these engineering breakthroughs, the balance in terms of popularity of different musical styles starts to be altered. In the late 19th century, this is hardly a cause for concern, but by mid-century, the unstoppable ascent of commercial music is apparent and, for example, certain centuries' old folk traditions start to disappear. Music, like all arts, is highly dynamic; however, the huge shift in terms of patterns of appreciation commences during this early period of engineering innovation. This will be returned to below.

Participation

☺ *New, exciting electric instruments*

It goes without saying that various inventions from the early Telharmonium to the Theremin to the Hammond organ and so many others offer new sounds and new musical opportunities both in terms of performance and composition. Panel colleagues will demonstrate this in their presentations.

☹ *(It will come, please be patient)*

There is, unfortunately, a downside to such inventions, but the other side of the story is not terribly important during this period. They will make a major impact in terms of the use of traditional instruments as we approach the present day.

Consumption & Diffusion

☺ *Phonograph and the recording industry*

Walter Benjamin – ‘reproducible art’ &

☺ *Broadcasts*

R. Murray Schafer – ‘schizophonia’

It is impossible to conceive of a world without recordings of your favourite music. Not only this, people’s most beloved performances were immortalised on the medium of the day. Slowly but surely, less known music and music from around the globe were made available to the general audience offering listeners the opportunity to celebrate the wonderful diversity of this art form.

Walter Benjamin is the spokesperson for the radical shift recording and broadcasting were to represent by coining the term, ‘reproducible art’. One no longer needed to be ‘there’, wherever there may be, to appreciate a work. It could be purchased or heard over the airwaves.

R. Murray Schafer, decades later, added the term, ‘schizophonia’ to denote the notion of displaced sound (i.e., not heard on location) or, in the case of broadcasting, music heard in more place than one at once.

Both of these men celebrate the radical opportunities these and subsequent breakthroughs represent, but simultaneously add a word of warning concerning the decrease of importance of the unique artwork, the unique communal atmosphere of a performance.

In terms of choice, the quickly thickening record catalogues of the day and the fact that more and more broadcasters were born, particularly in the US, demonstrate how quickly these reproducible art works were being made available.

Anecdotally, one effect of the way recordings were to evolve was the fact that the storage media in early days were ... well ... less well able to cope than for example, my USB storage medium on my key ring. I envy people in the early days of the recording industry who had to decide how to divide those Wagner opera recordings on to dozens of 78rpm record sides whilst attempting to retain some sense of continuity of those epoch works.

☺ *Impact on listening patterns in music &*

☺ *Is there really that much choice?*

Not only is the balance of appreciation to be reorganised radically due to the advances in engineering for musical use, the musical experience will also undergo extraordinary change in the 20th century. As the number of broadcasters and broadcast hours increase, as the phonograph becomes increasingly affordable and the recorded repertoire increases, a shift from participation as a norm (i.e., singing and/or playing an instrument), any music on stage providing a clear exception, towards a greater passive musical experience commences, a shift which will take on radical proportions in the second half of the century.

Another issue to arise concerns the question of whether the greater quantity of choice, in particular of broadcasters, implies a greater breadth of selection and of quality. Critics, in particular Herbert Marcuse, will start raising questions in the post World War II era about this. In his case, his concern was that people became more excited about what a radio, television or playback medium looked and sounded like than what was to be played on them. Our fascination with new inventions continues today. Furthermore, he queries whether more broadcasters meant more choice. In fact, other than the occasional marginal (e.g., late night) programmes, most radio stations, still today, compete for listeners by offering a very finite number of musical repertoires. For example, how much time was given to compositions of living art music composers on the radio some seventy years ago? Has that changed much today? If anything, it has declined. Similarly, as sales in folk music and even jazz music recordings descended throughout the decades, its presence on the airwaves has followed this descent. In short, the question might be posed: is the broadcast industry another cog in the wheel of the industrial complex or, alternatively, a source of inspiration supporting the wonderful diversity of music? The game is not over, but commercial industry is definitely holding the winning cards at the moment.

Venues for music

☺ *The home*

As a consequence of most everything written thus far, it is clear that the home was to become one of the leading venues, if not the key venue for the musical experience during this period due to newly designed media. To have such choice in one's own environment must have brought with it an excitement that could only have been dreamt of previously.

☹ *The home*

As suggested above, the move from communal musical venues, including the home, to the home as the key base for music appreciation represented the start of the evolution which would change the nature of the musical experience from one of participation for all to one based on consumption.

To conclude part 1, an interesting question deserves to be raised. Who was behind all of these innovations/inventions and what were they for originally? With few exceptions, very little impetus came from musicians during this period. In fact, the 'workshop' approach to engineering really commenced after 1945. This point is not being made to blame anyone, but I sometimes wonder whether, if one could turn back the clock, the combination of engineering incite and artistic imagination might have led to a more eclectic cultural spectrum today.

II. Ca. 1945 – the present day *From Analog to Digital Electronics and Music Technology*

Appreciation

☺ *Folk/pop/art music – revisited*

There's no looking back. The recordings and broadcast media have grown and are present in societies around the globe. For an inquisitive person, the ability to hear any music from any corner of the globe is exciting beyond words. What is centuries old in, say, Thailand, is completely fresh and new to a Westerner. In Western art music, old manuscripts are discovered and then it's a matter of time before the work is performed, broadcast and recorded. Our postmodern society is alive and well in our new musical culture.

☹ *Folk/pop/art music*

But what is the price for this wonderful selection? Indeed more folk music is available on recording than was previously imaginable. In fact that's a lucky thing as far as many societies are concerned, for like many languages, many folk cultures, particularly in what used to be called the 'first world', were reduced to their bare bones, some reaching extinction. For example, in England, folk musicians try their best to help a number of traditions to survive. However, these musicians work within a popular music world of agents, venues and specialist series as opposed to a world of music being made locally, involving local issues and histories, that is, the music of the folk.

You may say that there exists a form of music of the folk, today, namely popular music, in particular American popular varieties (and, to a lesser extent, British ones). The global village exists, but it is a bit one-sided. Reggae and Bhangra are exceptions to the Michael Jackson/Madonna rule. Folk music's history was a slow, organic affair involving neighbouring influences throughout the centuries. Pop music trends must change regularly, like any fashion, to ensure continuous sales figures. In short, the balance between these three forms of music has been radically changed and folk music, as we knew it, permanently damaged. Even contemporary art music has been completely marginalised, as the trade in Mozart and Beethoven has attempted to parallel the much larger markets of popular music.

☺ *The 'perfect' recording*

The invention of multi-track recording and the further development of digital recording has led to what I like to call the 'perfect' recording, perfect both in terms of performance and of sound quality. Some older readers may recall recordings with musicians making an occasional mistake or live recordings with memorable sounds that weren't erased by recording engineer alchemists. Today, our art is one of perfection. This does lead to a very relaxing listening experience. Yet, how many people actually play perfectly?

☹ *Some people's fear of inadequacy*

I sometimes wonder, and search to assemble relevant statistics concerning what I assume to be the decline of 'amateur' music making. I believe that this decline is due to two fundamental causes. First, as suggested, the pattern of behaviour in most 'first world'

countries has been towards a model of less music making participation and more ‘music taking’ consumption. This will be further discussed below. What is relevant here is a fear that many potential musicians are frightened by the ‘perfect’ recordings they hear, concluding that they are not ‘good enough’ for this art form. Certainly children haven’t stopped singing, but most of their parents have and as far as playing an instrument is concerned, let’s be honest: how many people do you know who still enjoy the pleasures of an instrument? I can’t imagine anyone involved in technology and design ever having thought of this as a potential consequence of their developments.

Participation

☺ *Electric and electronic instruments*

Advances seem to appear one after another ranging from the analog studio to electric guitars and all of those pedals to synthesizers to new digital software and devices and so many developments in between. One of the wonderful aspects of a number of these developments is that their entry level is lower than what was needed to play traditional instruments. This means that theoretically more people should be able to use them.

☹ *Pattern of acoustic instrument use*

What has happened is that, given popular music’s continued growth, the electric guitar was to supersede its acoustic cousin in terms of use in many countries and, similarly, the electric keyboard overtook the (more expensive) piano. True, many keyboards today (almost) sound like pianos, but a significant number of these keyboardists play the more dynamic timbres associated with popular music. And then there are all of the other instruments. With a higher population, has the number of oboists risen accordingly?

☺ *Musical systems of all sounds*

This point is not about sound systems (that will come), but instead concerns the potential approaches to organising sounds (and not just notes as one did in more traditional forms of music). Today anything goes. Genetic algorithms are used to determine compositions, and fractals, and also neural networks. Sonic artworks are works based on sounds. In short, anything goes. This opens up extraordinary technical developments and applications. It also has led to ...

☹ *Artistic confusion*

People are confused because, frankly, there is too much to choose from. Education organisations and the communications media tend to go with the flow and choose (commercial) winners, thus further marginalising a great deal of music. Clearly, the musicians involved are partly to blame due to many of them not being terribly engaged with their public. Ideally, music appreciation should reflect a broad horizon of interests, but instead of this many, many people are led to a very small breadth of the types of music on offer, an unhealthy state of affairs.

☺ *MIDI*

A paper like this one should tackle specific examples now and then, and the Musical Instrument Digital Interface is a very interesting case in point. MIDI was perhaps the single most important factor in terms of making a good deal of music technology

affordable. Certainly, technology becomes cheaper with time and, in particular, with mass acceptance. The reduction in data that MIDI involves has been one of the key factors taking new music technologies out of elite laboratories and studios and into private homes. Perhaps more people are making music these days after all.

⊗ *MIDI (and après MIDI)*

The MIDI protocol was developed at a time when the electronic music world was revolutionising every parameter known to music such as the application of time, dynamic, pitch, colour, space, and so on. What used to be measured in discrete entities (quaver and semi-quaver, forte and piano, B-flat and B and so on) could now exist in continua. MIDI ignores these continua. So it is progress in one sense whilst totally ignoring exciting musical progress in another. Today MIDI sequencers (which also originally focused on reduced data) have ‘audio’ versions allowing them to deal with any sound at any pitch with any time step desired by the user. The step to ‘audio’ is what one might call *après* MIDI, allowing for mass production and the above-mentioned innovations to be on offer at the same time.

An interesting case: the club DJ

To complete this section of part II, a brief visit to the world of the club DJ is called for. The question is, given other investigations in this paper, what is that the DJ does actually, make music, that is, perform? It is assumed that most people would answer this question in the affirmative, but the DJ is not playing his or her own music often and, in some cases is, well, playing records. Clearly our two choices of performing or appreciating are not adequate anymore.

Consumption

⊗ *33 and 45 rpm records*

These media were created during the period when the phonograph was no longer exotic, becoming something anyone possessed in a very large number of countries bringing a wide variety of styles, not to mention the latest popular music, to the masses.

⊗ *Pieces lasting 18-22' and 3-4'*

Although many may not find this terribly important, one oddity of these media was the fact that many pieces were created to fit on them comfortably. Just to give two examples, the famous early pioneer in electronic music, Morton Subotnick created a host of works to fit on one or two sides of the 33 rpm record. Furthermore, it is useful to note that our current attention span lasting less than four minutes has to do with the length of most 45 rpm sides. As a consequence of this mentality, there are new classical music stations internationally, including the UK's Classic FM that specialises in movements of works, not the works themselves. Not too surprisingly, many last the length of the old 45 rpm records.

⊗ *More powerful sound systems*

Some of the less youthful readers will remember with nostalgia and perhaps a sense of irony how our older sound systems delivered what was then known as ‘high fidelity’. Granted, many people purchase their systems today for their portability, artificial bass

and so on, rather than their fidelity; however, hi-fi today is, well, hi-fi. And loud is quite loud depending on how tolerant your neighbours are.

☹ *Music becomes louder*

Today's sound systems are both noise dampeners and noise makers. In the field of acoustic communication, one studies how our sound environment, or soundscape, has become progressively louder due to noise production in both urban and rural areas. Our sound systems are there to combat that noise and, equally, to amplify the increasingly loud performances in certain forms of music that reflect our noisier world. Tinnitus and hearing loss are a common side effect of our enjoyment of today's amazing amplification systems.

☺ *The computer 'generation' & trends*

As with any fashion, everyone involved with the IEEE is interested in technological developments – how exciting many of them are! Keeping up with computer processing speeds, with updated interfaces and devices and so on is a full-time job these days. Being at the sharp end of developments is one of the most exciting places to be.

☹ *Equipment, virtuosity, music consumption*

In music, there are the famous examples of the violinist or the Indian tabla player, both of whom are involved with years of study before their sound develops, their ability to achieve virtuosity evolves. For years, we have been replacing our equipment every two to four years with newer models, never truly reaching virtuosity with anything, unless it happens to be an interface or software programme that is downwards compatible, allowing for what might today be called digital virtuosity.

At the time of writing this, it is almost an embarrassment to be using Mac OS9 or working on a G3 platform as they are passé. Strange how some users struggle with the new and miss the old. It is our consumer culture that urges and, in some cases, forces people to purchase the latest equipment.

☺ *The walkman (any music anywhere)*

In the first half of the 20th century, music enters the home in a big way. With the invention of the transistor, music became portable. With the walkman, personal choice of music became portable as well. What more can you ask for?

☹ *The walkman*

People listening to their walkman whilst, for example, riding a bicycle are oblivious to their sonic environments, at least to an extent. If nothing else, this is dangerous.

☺ *The image culture*

As the radio became a lesser medium in many countries to the television, the aural culture evolved into an image culture. In one sense this has offered music the opportunity to be part of a huge assortment of audio-visual manifestations. Ironically, it is here that much

of today's innovative music can be found and tolerated (e.g., appreciated by stealth), if not enjoyed by mass audiences.

⊗ *'Repackaging' music*

That said, today's musical 'package' is increasingly an audio-visual one thanks in particular to MTV.

⊙ *Music consumption, I mean appreciation*

This 'package' mentality has led to a huge music industry that is as much a part of our consumer culture as anything else. To keep this industry intact, massive technological development work is always needed. Although today's recording industry is in a bit of a crisis due to piracy and the resolution of the current Napster initiative and its associated issues, music consumption has never been so high.

⊗ *'Music taking' >
music making (a further
shift in balance)*

The combination of the music industry with the psychological impact of a muzak culture (where background music is at least as prominent as foreground music in daily life) has led us to an armchair music culture in the first instance, one where music taking definitely reigns above music making. What happened to the wonderful notion of art being part of life? In a sense, the trend of club culture is a welcome step forward even if traditional musical performance is not involved, as listening is at least active and DJs offer the sense of human performance taking place.

Venues for music

⊙ *The Internet* (see under diffusion)

Diffusion

⊙ *At a cross-roads – the Internet*

We reach a point in our history where predictions commence and nostalgia/criticism ceases. The Internet or its successor will become the key means of musical dissemination one day. Will we then receive narrow-band musical programming at last by way of broadband? Something for everyone's taste will be available or already is at long last and the greatest diversity of opportunity for music making will be at your fingertips.

⊗ *The Internet: virtual
communication*

Yet there is still something awkward with the Internet, namely that it continues to be used primarily by individuals in (relatively) isolated surroundings. These individuals may be communicating with one or more people anywhere at a given moment. If we continue along these lines new virtual forms of communication will need to replace the specific advantages of physical presence, at least to an extent. CB radio was similar in many ways, turning many shy individuals into fairly extroverted virtual communicators. Are we moving from a traditional collective to an individual form of existence or, alternatively, defining new means of collectivism?

☺ *Global distribution*

Global distribution has been possible for quite some time. In terms of music, it is playing an increasing role, not only by way of CDs and the like, but also through new Internet protocols (see below). Any recording is available to anyone anywhere these days.

☺ *Local values?*

This universal availability of consumer goods has had an incredible effect on local forms of music, many of which have disappeared or been acculturated to a very large extent. Acculturation used to be a small-scale form of organic development normally involving adjacent cultures. Today it is often associated with Americanisation. Will local values play a greater role in the future? Global tensions today ironically suggest they might.

☺ *MP3*

Cylinders evolve to records evolve to cassettes evolve to CDs evolve to MPx. Distribution of recordings has worked similarly until MP3 and the like came into existence. No more frustration about waiting weeks for your local record shop or Amazon to send you your music. You can just download it.

☺/☺ *The future of diffusion*

Of course the move from the shop to the Internet raises all sorts of legal questions, recent tales of piracy not being the least of them. As dissemination becomes easier, so will new innovative means of file sharing. These are very interesting times.

The history in Parts I and II isn't as bleak as it may seem, this is food for thought after all, but I sometimes imagine whether potential cultural consequences in engineering advances are taken into consideration as much as the normal considerations offered to their potential application.

Where do we go from here? Let's now look into the future with a bit of fantasy ...

III. Looking into the Future

*From algorithmic jukeboxes to zero-time synthesis:
a potential A-Z of music in tomorrow's worldⁱ*

Looking ahead, we discover a world with increasing interactivity using digital technology; a world in which copyright means increasingly less; idem customs (the international border one, not the day to day one). We also discover a world in which one socialises in digital neighbourhoods where physical space is irrelevant. These are not my words, but instead all paraphrased visions of Nicholas Negroponte.

Unsure whether tomorrow's world will call for an alphabet change, the following, using our current alphabet, investigates twenty-six aspects of music and related technology that one might discover in the not too distant future.

A: Algorithmic Jukebox

The concept behind the algorithmic jukebox is simply that the user(s) can choose the type of music desired and the jukebox will play a new piece every time. Lyrics will be treated similarly. Sampling techniques will permit you to have your favourite musicians' instruments and voices processed so that you feel you are not meeting new, unknown performers with each click of your wireless device.

B: Beethoven II, no

We must now slowly but surely accept the fact that immortality is dead. Long live the ephemeral. Therefore, talented musicians unite and enjoy music while it takes place. For the here and now is the signature of our era.

C: Computer folk music

The notion of computer folk music supports the previous view concerning the ephemeral. More and more music making is taking place online. This is not a trend. As more people are able to communicate musically within cyberspace, the notion of music of and for the people will evolve, perhaps radically. The net will represent an important venue for the musics of the people, a k a folk music.

D: Dial-a-space

Dial-a-space will allow you to provide the listener with an audio environment of any size, reverberation and geometry you choose.

E: E-operas, e-symphonies, more interesting e-genres, not to mention e-instruments

Our orchestras and opera companies are begrudgingly attempting to reinvent themselves. The race is to find the quickest protocol for an e-opera and e-symphony before someone else gets there first. I leave it to the reader whether this is worth the collective effort. Actually, e-sacred music is not unthinkable either.

The map of music is awaiting revision. In the revised map of music, nothing will be lost, although some slices of the musical pie might get slimmer as the market organically becomes more segmented. New genres will evolve, including e-genres. Equally, as the Internet moves on from a MIDI-based to an audio-based standard, new e-instruments will be designed and shared, a very enticing prospect. Whatever happens, future instruments will include new imaginative keyboards. It is not unthinkable that certain new instruments increasingly resemble Play Stations and the like.

F: Fuzzy logic applied to a composition's development

Fuzzy logic is so damned logical. As Negroponte points out, a toaster should not be able to burn toast. So how can this be used in music? There must be some form of structural control of a composition to disallow us composers from writing those works which are simply too long. If fuzzy logic can keep our heating and air conditioning systems in line, it should be able to control any aspect or parameter in music.

G: Granular music's own Grammy Awards

Granular synthesis is but one of the many exciting new ways to create sound. People involved in granulation have been known to define sound entities, sound flows and structures as part of one holistic process. This type of thinking will continue to lead to new listening experiences. Some of these will become more universally recognised than they are currently. As these approaches and paradigms root more deeply appreciation will likewise be increased. Therefore the notion of a Grammy (or equivalent) for a granular piece is anything but an odd fantasy.

H: Household digital A/V installations

In the future one central multipurpose, multiprocessing machine should take care of things throughout the home (and elsewhere) rather well. Television and radio can be requested anywhere at any time. And, as Negroponte has often pointed out, we will be able to select bits that interest us in the same fashion as we choose items in our newspapers. Physically owning recordings will become unnecessary, as storage will take place at origin. All that we will probably need is some sort of multi-purpose triggering device. We will be able to look at wide screens or smaller ones in the same space depending on the atmosphere we want to create. And in terms of surround sound, it just might be a matter of a few years before we can transport ourselves into a totally different acoustic (e.g., dial-a-space) and visual environment at a touch of a button or transmission of a thought.

I: Internet Conservatoire

No one believes that an entire musical education can be taught by way of packaged music modules offered online. Many of us, however, underestimate what can be done at a distance. The efficiency gained by placing relevant elements online serving the student and lecturer alike is potentially significant. Time will tell whether one needs to be physically seated in a single space to make instrumental music collectively. As with everything in education, not to mention the arts, it is simply a question of finding a balance. The time lost by staff and pupil alike doing things one already knows or following a collective pathway is a shame and can be improved through online learning.

Slower students will equally profit by the Internet conservatoire of the future, as those repetitive tasks of learning where most deficiencies can be found are the easiest to implement.

J: Jazz online accompaniment

How many readers remember “music minus one” recordings (i.e., all music is recorded except the part to be played by the musician playing the recording)? What is being proposed here is not dissimilar, the difference being that the music is improvised as is the accompaniment. The future ambition here is that a) one need not purchase an expensive system as relevant programmes and sounds will be situated at origin, b) it will cater to any style, and c) it will cater to any level. The next step is the forming of online ensembles.

K: Kindergarten, electroacoustic composition in

When I was a young child, I was treated to the opportunity to play objects from daily life within a musical context at a nursery school. Today, young children can experience sonic art on Play Stations and the like and a wide variety of CD-ROMs. If we then evaluate the proportion of music they hear that involves sound in whatever form, the introduction of electroacoustic creation in kindergarten should perhaps become as common as group singing. All that is needed is an appropriate interface to assist in their being able to create a piece no matter how basic.

L: Length-variable works of music

Length-variable works of music are adjustable according to circumstance. This is one way of making tomorrow’s musical work more flexible, better fitted to the occasion.

M: Music

This was in question ... Suffice to say that no matter how hard we try to redefine or even destroy our art or our environment, music will survive us whether we define it as organised sound or anything else.

N: Neighbourhood interactive sound installations

Similar to the concept of dial-a-space, the notions of the flexible, portable concert hall, sonic playground and other day-to-day venues are inevitable. Modular, that is, multipurpose architecture is due to increase exponentially allowing people maximum choice of usage in communal spaces. Public artists will often call upon sound as part of the interdisciplinary, multi-sensual experience. With the continual lowering of prices accompanying the increase of sophistication of our sound equipment, it is perfectly feasible for neighbourhoods to get together and create dynamic sound installations that evolve with time or are regularly altered.

O: Osteopathic sound massage

Paul Hindemith coined the term, *Gebrauchsmusik*, music for use. He would never have envisioned this, but what is proposed here is a sound-based therapy to assist in righting what’s wrong with you.

P: Popular electroacoustic music

The reader has every right to challenge me here, as this is, indeed, nothing new. Electronica is but one trendy word for electroacoustic in popular music, and, then, there were Hendrix, Pink Floyd and Soft Machine, just to name a few, not to mention today's techno artists.

Q: Qualifications in computer game ingenuity

The computer game market is larger than the film market. It is a part of life of the majority of youths in the civilised world if not practically everywhere. Besides the entertaining and relaxation (if that's the proper word) aspects of computer games, there are also developmental aspects. I therefore suggest that we can expect the offering of qualifications to become standard practice similar to those of swimming diplomas, perhaps leading to equivalents of British GCSE and A levels. Similarly new forms of education will be devised whereby computer games are integrated into learning curricula.

R: Record and play back the world

For those who want art to deal with life, one means is through recognising, celebrating, manipulating and questioning our world's treasure of sound in tomorrow's sonic compositions.

S: Sonic puzzles

One can easily imagine the notion of sonic puzzles for recreational use. I don't believe I've ever known a name for those rectangular games where n-1 plastic pieces get moved around a grid of size n until you find the puzzle's image. A sonic equivalent would be easy to create. But that is only one type of game that could be sound-driven.

T: Twenty-four hour electroacoustic broadcasting

With the continued development of affordable technologies, market segmentation will increase offering the opposite of the broad wash of most television stations or the audience numbers-based policies of radio stations. Finely defined areas or communities will evolve. If we take current electroacoustic art music terminology into account, perhaps three radio (or Internet) stations can be expected: Acousmatic FM, Algorithmic FM and Interactive FM. A Venn diagram of the play lists of these stations would indeed demonstrate an overlap. When the overlap increases, new segmentation will be discovered and offered.

U: Ultrasonic art

I am sorry that there has to be an entry like this one. The fact is, I don't really know what I'm talking about here. Still, there will be an application found for ultrasonic art.

V: Virtual composition collectives

In the not too distant future the majority of collective music making will take place virtually. The types of composition made will often involve collective devising and improvisation. As players may not have the same or similar knowledge base, new genres will be created that might not have come into being in traditional contexts. And don't

forget that with time we will be able to see everyone playing during our e-music making if we so choose.

W: WYSIWYG composition notation

Today more and more people are exploring new means of creating music and the number of virtuoso mousists has increased accordingly. Clearly a good part of WYS concerns our ability to analyse organised sound according to a visual representation. The more we are able to identify musical architecture in this way, the better we will be able to create coherent and useful means for anyone to compose within a relevant WYSIWYG framework. Tomorrow's virtual composition collective will often use such tools as a means to participate in their communal activity.

X: XL, L, M, S – virtuosity levels of different versions of the same piece of music

If WYSIWYG can be applied at any level, the notion of a newly created composition being performable at various levels shouldn't seem so strange. Such flexibility has always been available within the framework of arranged or improvised music. The expectation here is that composers will have means to be able to create several versions of the same piece for use by players of varying abilities. In works that are not totally prescribed, some of the decision-making can take place by the performers. For those of you who cannot yet totally let go, here's the opportunity to keep your publishers from twiddling their thumbs. Why not publish a number of scores of the same piece in small, medium, large and extra-large versions on the virtuosity scale?

Y: Yoruban computer music

This entry concerns cultural identification and diversity in the digital culture. Digital music enables and can expect different 'regional' schools to live and thrive. Although no one is calling for the overthrow of acoustic musical instruments, digital instruments based on acoustic ones or yet to be created will play an important role in music making. Digital technology will not get in the way of and may end up supporting the cause for cultural diversity, especially when people of a specific cultural background or interest can create music together, even whilst being spread out around the globe.

Z: Zero-Time Synthesis

I wonder how many definitions there are currently of the term 'real-time' in music? When I studied computer music, real-time meant that the length of computation time did not exceed that of the piece you were trying to generate. It was rare then, common today. In many cases sound becomes audible as soon as it is triggered in performance or virtually. This should now be given the name zero-time synthesis.

It is too early to tell whether these A-Z entries represent good news, bad news or both. Time will tell, but the revolutions commenced ca. 125 years ago, which sped up incredibly during the latter half of the 20th century, continue with no indication of developments slowing down in sight.

Conclusion in the form of a moral to the story

This talk is not particularly interested in heroes or villains, but it does have a moral. Perhaps innovation should involve more than serendipity, as attractive as it is, or commercial potential. As technology becomes more tangible for most people on today's earth, individual and community interests and needs should be catered for. Consequently, those questions of balance addressed in this paper may develop in such a way that a number of our cultures' vital traditions can be rediscovered and music can again take on its wonderful roles in terms of everyone's creative spirit, community interests and daily life.

ⁱ This third part of this presentation is essentially the 'Reader's Digest' version of a talk given at the 'Music without Walls – Music without Instruments' conference that took place in June 2001 at De Montfort University and was published in the conference proceedings and in "Organised Sound" 6/2: 91–96 © 2001 Cambridge University Press and appears with the publisher's kind permission. The Negroponte remarks are drawn from his 1995 book, *Being Digital* (London: Hodder & Stoughton).